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A GLACIAL POT-HOLE IN THE HUDSON RIVER SHALES NEAR CATSKILL, N. Y.

HENRY FAIRFIELD OSBORN.

SOME years ago I was invited to examine a pot-hole of unusual interest, which had recently been uncovered on the east bank of the Hudson, directly opposite the town of Catskill, upon the estate of Frederick E. Church, the well-known landscape artist. At the time a number of drawings and photographs were taken, together with a few notes which may be of interest to the readers of the *Naturalist*.

This pot-hole lies at the base of a cliff of shale about seventy-five feet high, and was discovered in course of excavation of the shale for purposes of road-building. It was first indicated by a section of its diameter upon the side nearest to the base of the sharp cliff. It was then excavated with great care to a depth of twenty-five feet, when it suddenly narrowed from an average diameter of eight feet to a diameter of five feet, and finally it was found to terminate in a bowl about the size of a wash-basin.

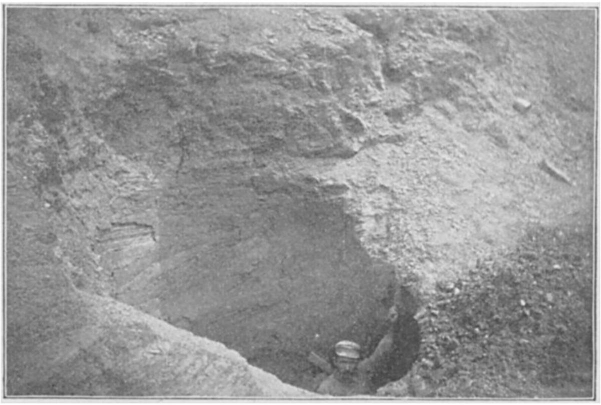

FIG. 1. — Side view of shale cliff and pot-hole.

The whole section for a distance of twenty feet in the comparatively soft shale exhibits the sides worn very smooth, almost to a polish. At the point of contraction the pot-hole dips into a stratum of black slate which is quite highly polished. The shale belongs to the Hudson River Series, and the slate to the Utica Slate.

The upper portion of the pot-hole was filled with shale débris which had evidently fallen from the cliff. This was followed by a stratum of five feet of gravel, similar to ordinary drift gravel, containing pebbles and well-rounded bowlders, varying from one inch to two feet in diameter. This was followed by a thick stratum of slate pebbles, while the lower portion of the bowl was filled with the black paste left from the wearing of the slate and containing a few perfectly rounded pebbles. There were no crevices to account for the carrying off of the stream of water which must have produced this pot-hole, and its depth indicates that it was formed in the bed of a powerful stream.

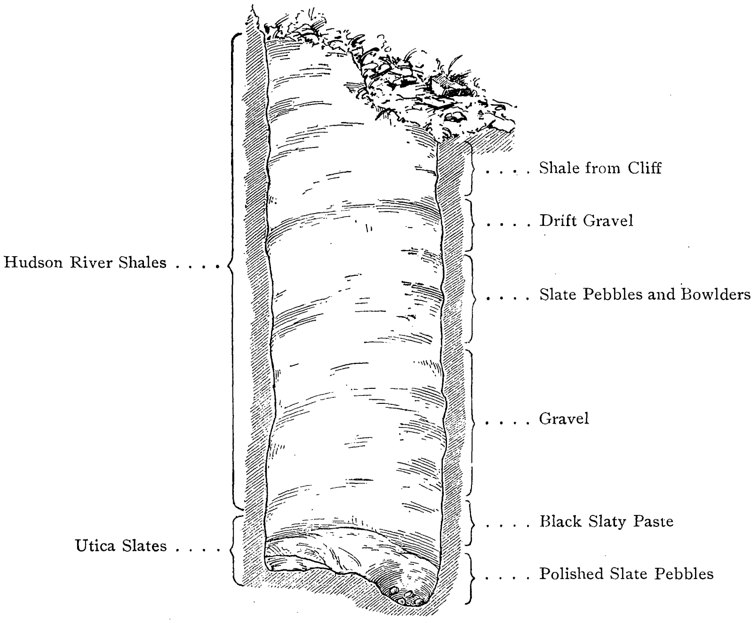
Hudson River Shales . . . .
Utica Slates . . . .
. . . . Shale from Cliff
. . . . Drift Gravel
. . . . Slate Pebbles and Bowlders
. . . . Gravel
. . . . Black Slaty Paste
. . . . Polished Slate Pebbles

FIG. 2.

At the top of the pot-hole the face of the cliff ascends sharply, and the surrounding sides have been uncovered so recently that we have every reason to believe the pot-hole was originally of very much greater depth than at present; and this, together with its peculiar position, renders it rather difficult to explain its origin and history. Its location is about half a mile back from the river, and the face of the cliff has a north and south direction.

In the twenty-first annual report of the Regents of the University of the State of New York on the condition of the State Cabinet of Natural History, published in Albany in 1871, is found an account of the discovery of the Cohoes Mastodon by Professor James Hall. He here gives an interesting description of the glacial pot-holes in the vicinity of the present gorge of the Mohawk near Cohoes. These holes are now mostly covered by swamps and were evidently bored out from the general level. They reached a depth of from seventy to eighty feet, and their cross-sections varied from eight to thirty-five feet.

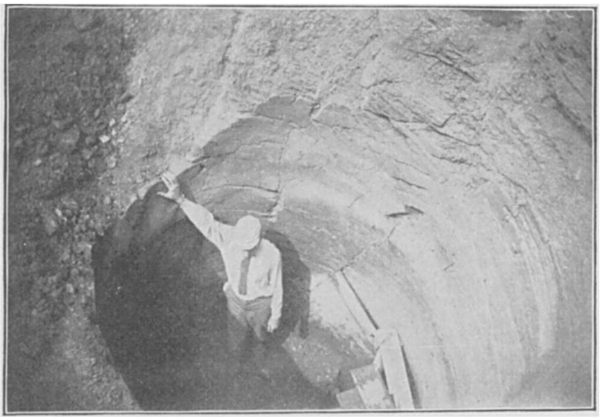

FIG. 3. — Pot-hole viewed from above, showing top of Utica slate layer where the erosion began to diminish.

From these facts it appears probable that the Catskill pot-hole here described originally extended to the level of the top of the cliff.

Its formation was in this case similar to that which has been observed as now in process beneath some of the glaciers of Switzerland, Norway, and Sweden. In Norway they exist in great numbers and are popularly known as "Giants' Kettles." In Oswald Heer's *Urwelt der Schweiz* we find a full description of some of the Swiss pot-holes. On the mode of formation of these holes Geikie speaks as follows: "Among the Alps, during the day in summer, much ice is melted and the water courses from the glaciers accumulate in brooks which, as they reach the crevasses, tumble down in rushing waterfalls, and are lost in the depths of the ice. Directed, however, by the form of the ice passage against the rocky floor of the valley, the water descends at a particular spot, carrying with it the sand, mud, and stones which it may have swept away from the surface of the glacier. By means of these materials it erodes deep pot-holes in the solid rock, in which the rounded detritus is left as the crevasse closes up or moves down the valley."